Water as an Environment

District of Columbia

Fisheries and Wildlife Division

Importance of Water

What percent of the planet's surface does water occupy?

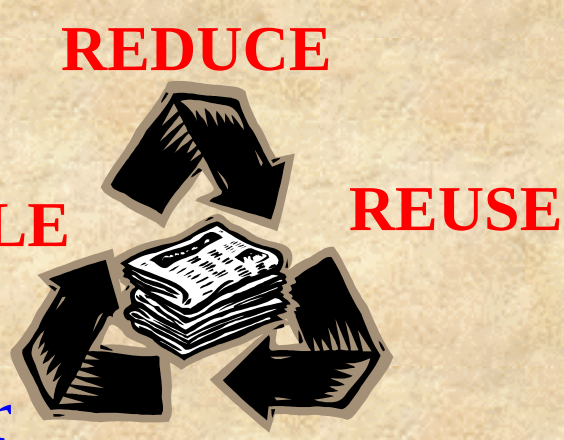
About 70%

What percentage of the water is freshwater vs. saltwater?

- **The Oceans account for 98% of the Earth water.**
- **Antarctic ice is 2%.**
- **Rivers and Lakes account for 0.03%**
- **Atmospheric water vapor for up to 0.001%**

Use and Conservation

How much freshwater is used daily?



- 3-4 gallons to flush a toilet
- 30-40 gallons to take a bath
- 30 gallons for an automatic dishwasher
- 10 gallons to make a single gallon of gasoline
- 250 tons of water to make one ton of newspaper.

What is Conservation?

The wise usage and care of any natural resource.

Types of Water

What are the three types of water?

1.) FRESHWATER:

Contains little or no salt. <.05 ppt

2.) BRACKISH:

Contains little to moderate amounts of salt. .05 - 30 ppt

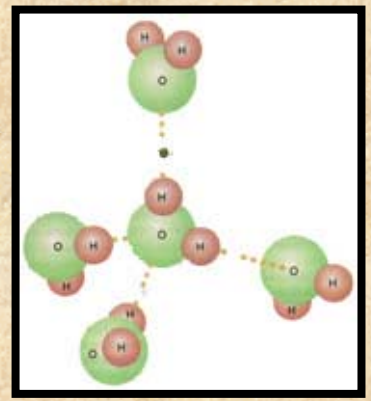
3.) SALTWATER:

Contains on average 33 ppt salt.

Properties of Water

States of water?

Liquid, gas or solid



The water molecule:

One atom of oxygen and two Hydrogen atoms. The two hydrogen atoms form an angle of 105 degrees with the oxygen. It is this arrangement that gives water some of its unusual properties.

Properties of Water

Biologically important properties of water:

1.) **High Boiling Point** allows water to exist as a liquid at the Earth surface temperature.

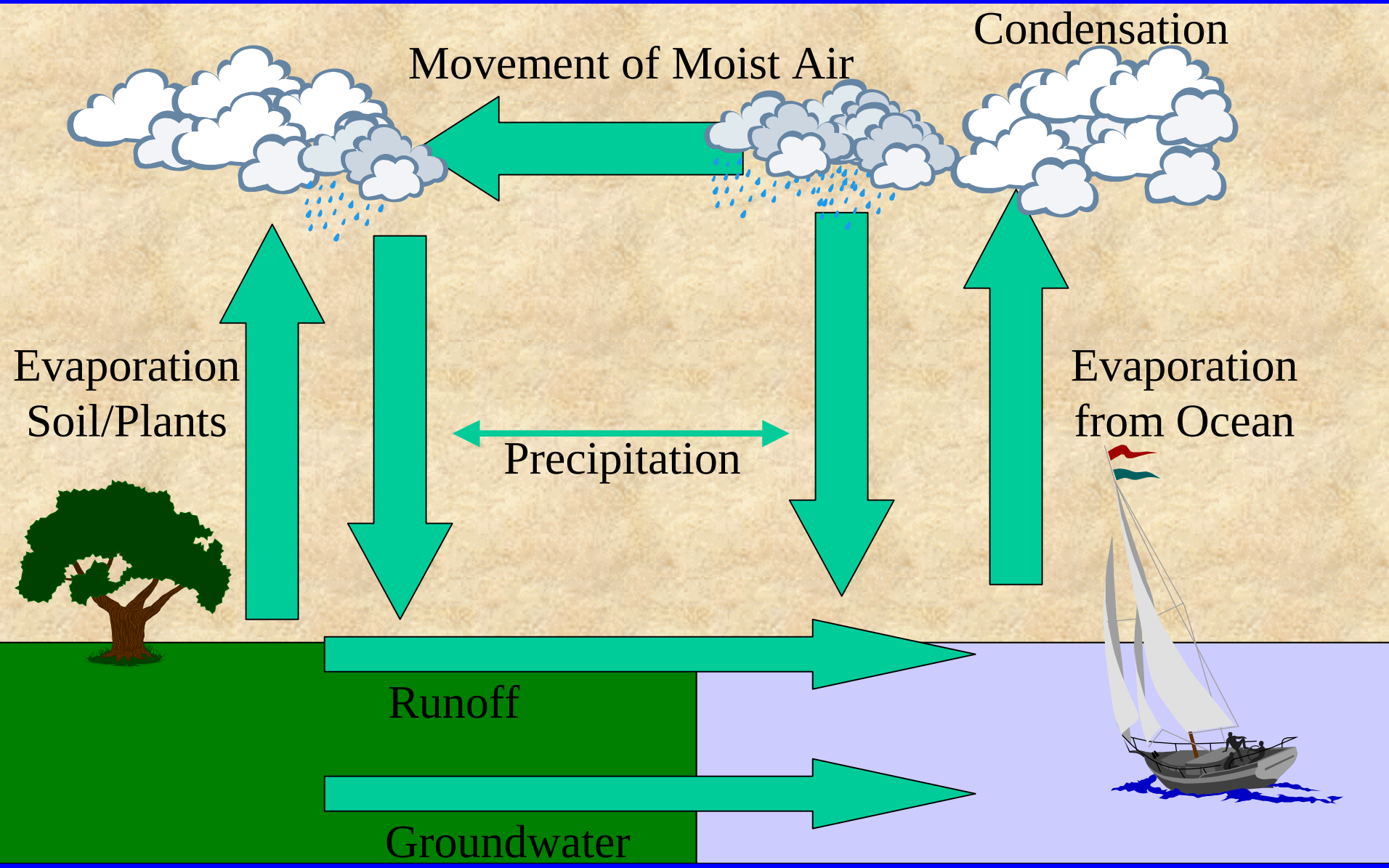
2.) **High Freezing Point** allows water to exist as a liquid at the Earth surface temperature.

3.) **High Surface Tension** important for organisms that live on the water's surface.

4.) **Density** is unique among solids, this allows ice to float.

5.) **Universal solvent**, water dissolves more substances in greater amounts than any other liquid.

Water Cycle



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Water Quality

Comfort Zone:

The area of the environment with optimal conditions such as light, oxygen, temperature and current. Water quality can affect the comfort zone.

Water Purity:

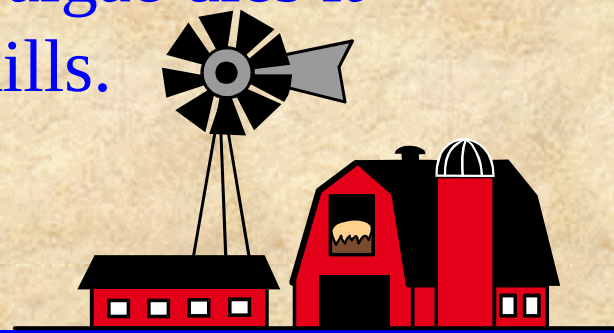
- Can vary by seasonal influences (ie. Drought or flood)
- Turbidity can influence water purity.
- Pollution can affect water purity.

Water Quality

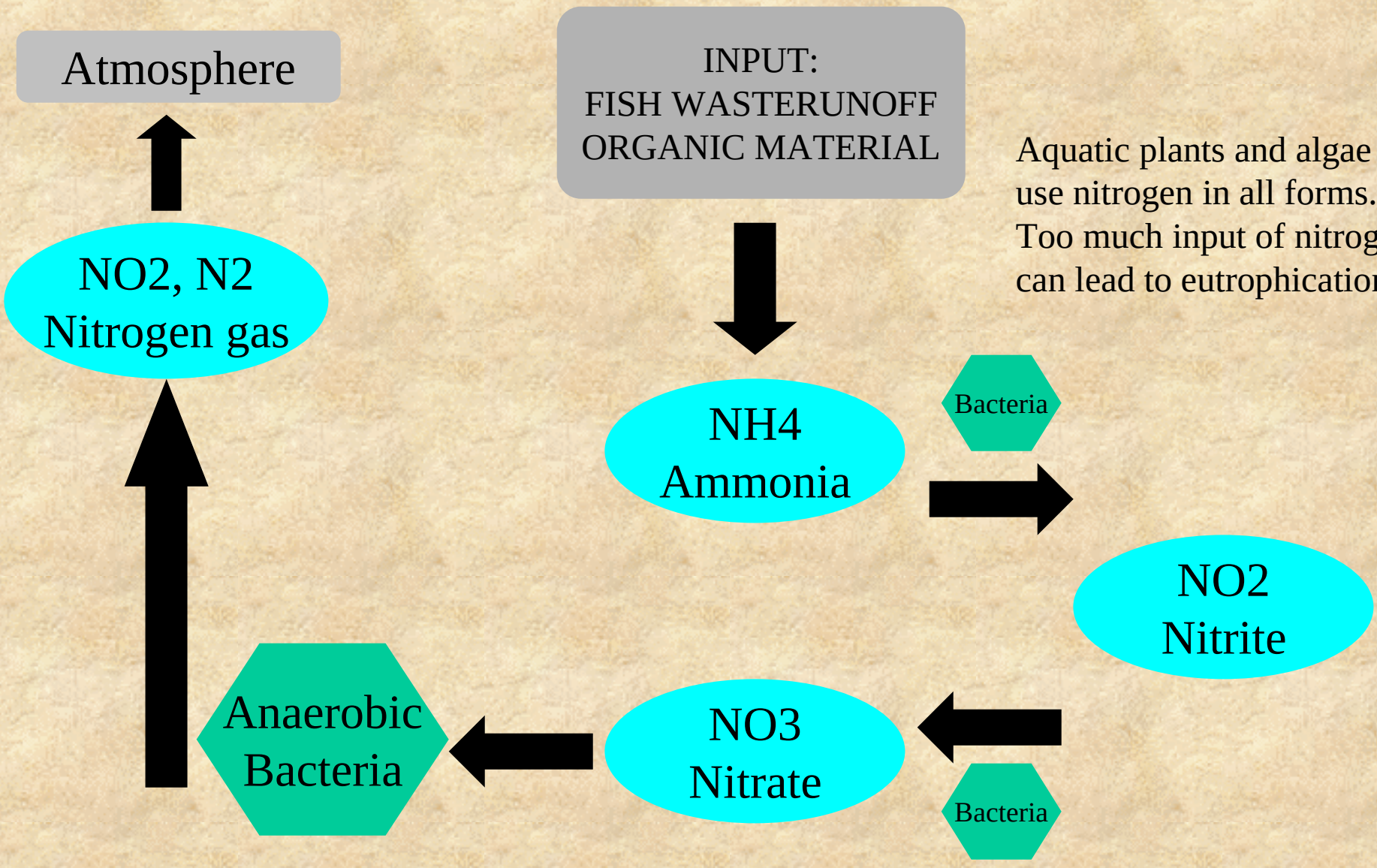
Eutrophication:

Excess of nutrients and minerals that results in a body of water favoring certain types of life. (ie. Algae)

Pollution from land, such as fertilizers can result in excess amounts of phosphorus and nitrogen entering a body of water via runoff. These excess nutrients lead to increase algal growth. The algae allows less light to penetrate the water, which can affect SAV (decreased photosynthesis). Additionally when the algae dies it consumes oxygen and can lead to fish kills.



Nitrogen Cycle



Impact on Fish

Light penetration:

Turbidity: Sediment runoff from land. Construction could increase turbidity as more sediments enter the water. With increased turbidity complications can arise in predator prey relationships. Also increased turbidity can mean less light penetrates the water for SAV. This change can disrupt food webs.

Water Stratification

Water Layers:

During the summer months water in large lakes, estuaries, and oceans becomes stratified. The water forms into layers each at a different range of temperature.

Epilimnion

Metalimnion

Hypolimnion

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Water Turnover

Seasonal Effects:

In an example of a northern lake after winter we can see seasonal water turnover. As the sun warms the ice on the waters surface the surface waters reaches 39 degrees F, at this temperature the water sinks to the bottom with the help of wind and currents. This pushes the colder bottom water up to the top. This helps to recycle nutrients in the system and increase productivity.

Water Temperature

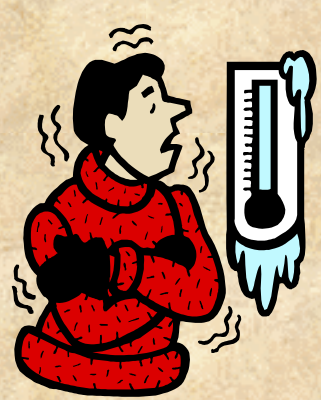
Relationship of Temperature and Oxygen:

Water temperature is perhaps the most important factor in determining where fish live and their behavior.

In warmer water fish require more oxygen as metabolism increases. However at higher temperature the water holds less oxygen.

Temperature Stress:

Rapid changes in temperature stresses fish.



Summary

- Importance of Water.
- Use and Conservation.
- Types of Water.
- Composition of Water.
- The Water Cycle.
- Water Quality.
- The importance of water quality to fish and plants.